

SB761
U7R63
1985



United States
Department of
Agriculture

Timber,
Forest Pest,
& Cooperative
Forestry
Management

Denver, Colorado



FOREST PEST CONDITION IN THE ROCKY MOUNTAIN REGION for 1985



FOREST PEST CONDITIONS
IN THE
ROCKY MOUNTAIN REGION
1985

by
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and
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April 1986

Timber, Forest Pest, and
Cooperative Forestry Management
Rocky Mountain Region
USDA Forest Service
11177 W. 8th Avenue
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EXPERIMENT STATION

Cover design: Application of Etherel for control of lodgepole pine
dwarf mistletoe in a developed recreation site on the Arapaho and
Roosevelt National Forests, Colorado.

MAILING LIST UPDATE AND REVISION - Annual Report 1985

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ACKNOWLEDGEMENTS

The Forest Pest Management (FPM) staff of the Timber, Forest Pest, and Cooperative Forestry Management Unit extends appreciation to all cooperators who contributed information to this report.

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Special Publication Announcement

The Rocky Mountain Station, in cooperation with the Great Plains Agricultural Council (GPAC) Committee on Forestry, is publishing a comprehensive handbook on diseases of trees in the Great Plains. Research and pest management plant pathologists from throughout the Great Plains contributed articles on 64 diseases.

The handbook, a project of the Pest Management Task Force of the Forestry Committee, GPAC, will be issued as a Rocky Mountain Station General Technical Report with full color illustrations. Articles will emphasize the diagnosis, biology, damage and control of diseases. It is intended that the publication be available for distribution in June 1986 for the GPAC Forestry Committee Meeting and International Shelterbelt Symposium in Lincoln, Nebraska.

DISEASE AND INSECT CONDITIONS IN BRIEF

Lodgepole pine dwarf mistletoe and comandra blister rust continued as the most damaging disease agents in the Rocky Mountain Region. Survey and suppression activities for lodgepole pine dwarf mistletoe have been continued in Colorado and Wyoming.

Root diseases are being monitored throughout the Region. Although annual losses are not known, it is suspected that they cause a considerable drain on the resources in the form of growth loss and mortality. Annosus root disease has been confirmed in new locations on the Nebraska National Forest. Armillaria root disease and mountain pine beetle have been shown to be significantly associated in ponderosa pine stands in the Black Hills of South Dakota.

The use of pesticides continues as an important part of integrated pest management. Pesticides are valuable tools in forest tree nursery management and control of noxious weeds and undesirable vegetation in range management. The nationwide ban on aerial application of herbicides continued in 1985.

The western spruce budworm and mountain pine beetle still rank as the most notable extensive damaging insects in the Region. Permanent plots continue to be monitored to assess budworm impact on annual growth and mortality to Douglas fir. Apparent winter kill has caused some decline in mountain pine beetle populations in several areas surveyed in the Colorado high country and is suspected to have occurred in parts of Wyoming.

Ips beetle increased in the northern Black Hills of South Dakota. Pockets of up to 150 killed trees were reported. The combination of Ips, mountain pine beetle, and armillaria root rot have some local foresters suspecting a massive bark beetle outbreak soon.

INTRODUCTION

Forest Pest Management is responsible for detection, evaluation, prevention, and suppression of insects and diseases on forested Federal lands. Forest Pest Management also administers financial and technical assistance programs, which are available to State and private landowners of forested lands through the Cooperative Forestry Assistance Act of 1978 Public Law (95-313).

In 1985, insect and disease detection surveys were performed on over 25 million acres throughout the Rocky Mountain Region, many in cooperation with state pest specialists in Colorado, Kansas, Nebraska, South Dakota, and Wyoming.

STATUS OF DISEASES

DWARF MISTLETOES

SURVEY AND SUPPRESSION ACCOMPLISHMENTS:

Action plans for survey and suppression of lodgepole pine dwarf mistletoe, Arceuthobium americanum, have continued throughout the Region. Presuppression surveys were conducted on 37,184 acres on the Arapaho and Roosevelt; Medicine Bow; Pike and San Isabel; Rio Grande; Routt and Shoshone National Forests. Silvicultural control was conducted on 5,546 acres of infested lodgepole pine stands on the Arapaho and Roosevelt; Grand Mesa, Uncompahgre, and Gunnison; Medicine Bow; Pike and San Isabel; Routt; Shoshone and White River National Forests. (Table 1)

Table 1. Acres of presuppression surveys and suppression projects conducted in 1985 for dwarf mistletoes on Federal lands.

National Forest	Presuppression Survey Acres	Suppression Project Acres
Pike and San Isabel	7,012	12
Arapaho and Roosevelt	14,200	932
Grand Mesa, Uncompahgre, and Gunnison	- -	500
Medicine Bow	5,100	3,102
Rio Grande	822	- -
Routt	10,000	800
Shoshone	50	50
White River	- -	150
TOTALS	37,184	5,546
Bureau of Land Management (USDI)		
Colorado	590	330
Wyoming	- -	30
TOTALS	590	360

RESEARCH ACTIVITIES:

Evaluation of Ethephon for Dwarf Mistletoe Control

A study begun in 1983 by researchers from the North Central and Rocky Mountain Forest Experiment Stations to test plant growth regulators as a control for lodgepole pine dwarf mistletoe in Colorado, was expanded in 1985. Approximately 230 trees in the Arapaho National Forest Cutthroat Bay Campground were treated with ethephon (an ethylene-based growth regulator) using a hydraulic jet hand-sprayer. This chemical promotes abscission of mistletoe shoots. Eighty percent of treated shoots abscised and the dwarf mistletoe rating on overstory trees dropped 30 percent (from a dwarf mistletoe rating of 5.3 before treatment to 3.7 after treatment). The average rating of understory trees dropped 80 percent (from 2.6 to 0.5).

Although ethephon does not kill the endophytic system, new shoot development on treated infections has been slow. It is estimated that significant new mistletoe seed production will not occur until 4-6 years after treatment. Additional tests are planned in 1986. Tests of the chemical on A. vaginatum on ponderosa pine also look promising.

Modeling Dwarf Mistletoe Effects in Ponderosa Pine Stands

A project at Colorado State University, Fort Collins, Colorado, to model the effects of dwarf mistletoe (A. vaginatum) on the growth and yield of irregular ponderosa pine stands along the Colorado front range, is nearing completion.

Growth was modeled as decrement from a potential yield as a result of inter-tree competition. Potential yield was developed from variables describing site and intrinsic individual tree growth patterns. Reduction in potential growth was modeled as a function of stand density and the relationship of the size class to average stand diameter.

Dwarf mistletoe infection affected both the potential growth of trees and competitive relationships between trees:

1. Potential growth decreased significantly as the size class became heavily infected.
2. As surrounding trees became heavily infected, they exerted less competitive influence.

STEM RUSTS AND CANKERS

ASPEN CANKERS:

Research on the growth of the aspen canker fungi at the Rocky Mountain Forest and Range Experiment Station, causing sooty-bark canker, Encoelia pruinosa, and ceratocystis canker, Ceratocystis fimbriata, revealed that vertical growth was 44.9 ± 3.7 cm/yr. for E. pruinosa and 2.8 ± 0.4 cm/yr. for C. fimbriata. Horizontal growth rates were 16.3 ± 0.7 cm/yr for E. pruinosa and 1.3 ± 0.2 cm/yr for C. fimbriata. This information will be valuable to recreation site managers in predicting the longevity of infected trees.

COMANDRA BLISTER RUST: Cronartium comandrae Pk.

A research project at Colorado State University to determine means of risk-rating lodgepole pine stands to comandra rust is nearing completion. The study area was located on the Wind River Ranger District, Shoshone National Forest, and has abundant populations of the alternate host, Comandra umbellata, and lodgepole pine. The development of a disease prediction system based on: (1) lodgepole pine stand characteristics; (2) distance between lodgepole pine and comandra populations; and (3) meteorological conditions at time of basidiospore development, dispersal and germination, would be helpful to forest managers.

A survey to determine where and under what conditions C. umbellata populations occur was undertaken to help in developing a risk-rating system. Results indicate comandra occurred most often on dry, middle slopes and ridge-tops of southwestern exposures. Sagebrush was the most common vegetation type associated with comandra populations, being found on 87 percent of all sites containing comandra.

Comandra rust incidence in the lodgepole pine stands of the Wind River District ranges from 3 percent to 64 percent, and averaged 50 percent. Rust incidence seems to increase as mean stand height increases. Correlations with other stand and site characteristics have not been firmly established at this time.

Comandra rust wave-years may be defined by the occurrence of rare meteorological events. In the Wind River District, east winds capable of holding moist weather systems over the area for 12 hours or more, giving basidiospores time to develop, disperse, and infect trees, may be a key event leading to high levels of infection. Work is continuing to evaluate this hypothesis.

Dispersal distance relationships of the rust are being examined using the WINDS and CITPUF simulation models. No clear relationships have been found to date.

WESTERN GALL RUST: Endocronartium harknessii (J.P. Moore) Y.Hirat.

Western gall rust, caused by Endocronartium harknessii, was reported by FPM in a 25-acre lodgepole pine stand on Buckhorn Creek, Roosevelt National Forest, where surveys for Armillaria root rot have been conducted. Large galls on the main stem of potential crop trees were observed in 39 trees per acre. Branch galls were observed on an additional 19 crop trees per acre.

THYRONECTRIA CANKER: Thyronectria austro-americana (Speg.) Seeler

Four honeylocust cultivars (Skyline, Imperial, Sunburst and Thornless) have been evaluated at Colorado State University for resistance to Thyronectria canker expansion. Results indicate Sunburst is the most susceptible and Thornless is the most resistant. Partial mechanical girdling of the trees did not appear to have any effect on canker expansion or callus production (canker healing). Work is also continuing in screening fungicides for prevention of infection.

ROOT DISEASES

ANNOSUS ROOT DISEASE: Heterobasidion annosum (Fr.)Bref.

Annosus root disease was confirmed by FPM on jack pine at a new location, Bessey Ranger District, Nebraska National Forest. It was first reported in 1965 and not reported again until 1982. The centers on the Coyote sale reported in 1982 are still active. New centers were discovered in 1985 on the Bullsake sale. With the recent emphasis in timber management on the Forest and subsequent intensive inventory surveys, we believe additional centers will be discovered.

ARMILLARIA ROOT DISEASE: Armillaria spp.

Examination of a random selection of 63 ponderosa pine stands by FPM on the Black Hills National Forest revealed a high incidence of both Armillaria root disease and mountain pine beetle, 89 and 79 percent, respectively. A significant ($p=.10$) association between mountain pine beetle and the root disease was found in the northern, but not the southern Black Hills. It is suspected that root disease centers may serve as foci for endemic populations of the beetle.

Armillaria root disease in a 25 acre naturally-regenerated lodgepole pine stand on Buckhorn Creek, Estes-Poudre Ranger District, Arapaho and Roosevelt National Forests was resurveyed this last year. Plots were established in 1959 and monitored annually for five years. The stand was thinned in 1964 and re-examined in 1977 prior to a second pre-commercial thinning.

In 1960, annual losses to the disease were nearly two percent, but steadily declined to 0.4 percent by 1964. In 1977, the stand was about 30 years old with an average diameter of 4.3 inches and height of 23 feet. Of the 1,292 trees per acre, 98 trees/acre were killed by root disease. All the dead trees examined were suppressed, non-crop trees.

In 1985, the average stand diameter was 5.5 inches and average height was 33 feet. Of 415 lodgepole pine per acre, 10 suppressed trees were killed by root disease.

BLACK STAIN ROOT DISEASE: Ceratocystis wageneri (Kend.) Goheen and Cobb

Aerial and ground surveys since 1975 have shown black stain root disease centers in pinyon to be widespread throughout the Mesa Verde National Park and west of the Continental Divide. Results from seven plots established in 1978 indicate the disease is still active in the Park. Over the seven disease centers examined, 33 percent of the trees were killed within six years. An average of three trees per plot were killed annually. If the current rate of mortality is sustained, 55 percent of the stocking on these sites will be killed over a ten year period. The average mortality on these plots is similar to that reported by Wagener and Mielke for 1942-1952. Mortality in these centers, as throughout the Park, continues to add to the fuel load.

NURSERY DISEASES

PATHOGENICITY OF FUSARIUM ISOLATES TO LODGEPOLE PINE

Many species of Fusarium are commonly found in soil, but not all are pathogenic. Pathogenicity of ten Fusarium isolates from Colorado and Nebraska nursery soil and conifer seedlings to lodgepole pine seed and seedlings were conducted last year by FPM.

Each Fusarium isolate was tested against 50 germinating seeds with 5 seeds equidistant from a 6 mm plug of Fusarium mycelium per plate on moist filter paper. Fifty uninoculated seeds were germinated as checks.

Each Fusarium isolate was also tested against 50 seedlings growing in containers in a growth chamber. Each container was inoculated with a 6 mm plug of Fusarium mycelium covered with moist cotton. Seedlings were water-stressed for 2 months before the experiment was terminated.

Unhealthy seeds and seedlings were plated on medium selective for Fusarium to determine whether the seedlings were infected with the same Fusarium with which they were inoculated.

Up to 76 percent of the lodgepole pine seed was destroyed by damping-off due to Fusarium infection. Although none of the container seedlings showed the cortical sloughing typical of Fusarium root rot, a high percentage of the withered and chlorotic seedlings were infected with the same Fusarium with which they were inoculated. The most pathogenic Fusarium species were F. moniliforme, F. oxysporum, F. solani, and F. acuminatum.

THERMOPHILIC MICROORGANISMS IN SOLAR HEATED SOIL

Thermophilic microorganisms cannot grow below 20°C, and have optima above 40°C. Thermotolerant microorganisms can grow below 20°C, and have maxima above 40°C.

Populations of thermophilic microorganisms in check and solar-heated soil from Bessey Nursery were compared by FPM. Most Probable Number (MPN) dilutions in nutrient broth with 2.5 percent glucose incubated at 50°C showed no increases in thermophilic microorganisms in solar-heated soil. Soil dilution plates on yeast starch agar showed no increases in thermophilic fungi or Actinomycetes due to solar heating.

Aspergillus fumigatus and some thermotolerant bacterial isolates were highly competitive with Fusarium spp. in culture. Thermotolerant microorganisms are implicated in reductions in populations of plant pathogens following solar heating. Reports will be available later this spring describing the above projects.

OTHER DISEASES

WETWOOD BACTERIA IN PLAINS COTTONWOOD

In the past, a variety of bacterial associates have been isolated from conifer and hardwood wetwood. While effects for most of the bacterial species have not been elucidated, some of them are clearly pathogenic, others adversely affect wood quality, and some associations are beneficial to the infested trees.

In a recent study at Colorado State University, increment borings were taken from six-year-old Populus sargentii (6" dbh) to provide material for isolation and identification of resident bacteria in the wetwood cylinder. Preliminary results show several bacterial species may be present including both Gram positive and Gram negative organisms. The most frequently encountered bacteria were in the genera Corynebacterium, Erwinia, and a Gram negative rod that cannot yet be identified even to genus though it is easily recognized by its penetrating pungent odor. Work to identify these bacteria is continuing.

CONIFER NEEDLE MOTTLING AND STIPPLING

An unknown cause of mottling and stippling of conifer foliage on several species including ponderosa pine, Douglas-fir, white fir, and Rocky Mountain juniper was noted north of Durango, Colorado by the Colorado State Forest Service and FPM. All size classes were affected. The mottling did not appear to affect the growth of the trees. Foliage retention was normal. Needles were green except for discrete, small bleached areas primarily on upper surfaces of all ages of needles including the current year. Foliage samples were more closely examined in the laboratory. Spots were fairly discrete but variable in size. The cuticle was intact, not eroded. Mesophyll cells were intact and showed no deterioration. Insect damage was discarded as an explanation. Winter flecking caused by reflected light off the snow has been suggested as the cause. However, additional observations are needed to elucidate the cause of the symptoms.

PONDEROSA PINE DECLINE

In 1985, aerial and ground surveys indicated approximately 215,000 acres of ponderosa pine showed symptoms of decline on the San Juan National Forest. These symptoms were observed in developed and undeveloped areas of National Forest and private lands. Examination of trees by entomologists and pathologists in the corridor between Pagosa Springs and Durango, Colorado, revealed a complex of insects: pine budworm, Choristoneura lambertiana; pine butterfly, Neophasia menapia and pine needle sheathminer, Zelleria haimbachi. No single causal agent has been implicated. Climate (drought), water table drop, advanced stand ages, and possibly reduced air quality are suspected contributors to the complex that is affecting ponderosa pine.

HAZARD TREE SURVEY IN DEVELOPED CAMPGROUNDS IN THE ROCKY MOUNTAIN REGION:

Forest Pest Management completed a two year study of potential hazard trees in developed recreation sites on National Forests of Region Two. Based on defects observed, 7,312 trees were rated for potential hazard. Approximately 20 percent of the trees were rated high risk. Forty-five percent were less than high risk and 35 percent were without defect. The average number of trees per campground rated high risk ranged from 3 to 58 for campgrounds with 10 to 50 percent potentially high risk trees. Considerable variation existed in the frequency of defects associated with potential hazard within and between species. The variation is attributed to the frequency of use of a campsite, type of user, and tree species mix.

The sampling system used is taught through the R-2 Hazard Tree Instructor Training (HTIT). It has been used in several states and Regions, and works well.

A revised Hazard Tree Instructor Training package is being developed and will be available the winter of 1986. Wider audience appeal is anticipated; e.g., city parks, municipalities, state, federal, and private outdoor recreational resource managers and arborists. The training program will consist of several packages which will (1) sensitize administrators, managers, and users of outdoor recreation resources to the importance of vegetation management to reduce potential tree hazards, (2) allow the trainer to tailor his training to the needs of the local trainees and situations, and (3) get trainers to develop their own application package for their locality.

Rocky Mountain Region--Summary of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

Disease	Host	Location	Remarks
STEM AND BRANCH DISEASES			
Comandra blister rust <u>Cronartium comandrae</u>	Lodgepole pine	Wyoming	Continues as the most serious disease of lodgepole pine on the Wind River Ranger District, Shoshone National Forest, where more than half of the mature trees are infected and 85 percent of infected trees have dead tops.
Cytospora canker <u>Cytospora kunzei</u>	Blue Spruce	South Dakota	Statewide increase in number of requests from private landowners regarding this disease on urban and shelterbelt trees.
Dwarf mistletoes <u>Arceuthobium americanum</u>	Lodgepole pine	Colorado, Wyoming	Remains the most important disease on Federal lands in the Region. Found on about 518,000 acres in Colorado and 361,000 acres in eastern and central Wyoming causing mortality and growth loss equal to approximately 10 million cubic feet. Presuppression surveys were conducted on 37,184 acres on six National Forests. Silvicultural control was conducted on 5,546 acres on seven National Forests.
<u>Arceuthobium vaginatum</u> subsp. <u>cryptopodum</u>	Ponderosa pine	Colorado	Approximately 20 percent of the host type is infested. Annual losses amount to over 885,000 cubic feet. Most common in the <u>Pinus ponderosa/Muhlenbergia montana</u> habitat type.
Fusarium canker <u>Fusarium</u> sp.	Black walnut	Kansas	Reported as severe in a 10 acre plantation in the southcentral part of the State.
Nectria canker <u>Nectria</u> sp.	Honeylocust	Colorado	Reported on 0.5 and 3.5 percent of urban trees in Greeley and Berthoud, CO, respectively.
Poplar cankers <u>Dothichiza populea</u> <u>Cytospora chrysosperma</u> <u>Phomopsis macrospora</u>	Cottonwood, hybrid poplars, Lombardy poplar	South Dakota	Common Statewide.

Rocky Mountain Region--Summary of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Disease	Host	Location	Remarks
Russian olive canker <u>Phomopsis</u> or <u>Tubercularia</u>	Russian olive	South Dakota	For the last two years increased reports of mortality in shelterbelts. Incidence highest in areas affected by drought and grasshopper populations.
Siberian elm canker <u>Botryodiplodia</u> <u>hypodermia</u>	Siberian elm	South Dakota	Declining and dying Siberian elms throughout the State continued increasing in numbers and severity. Herbicide damage is suspected as one of the stress factors involved. Concern is increasing over the loss of trees in many communities.
Thyronectria canker <u>Thyronectria</u> <u>austro-americae</u>	Honeylocust	Colorado	Continues as an urban tree problem along the Front Range killing 1-2 percent of trees annually.
Western gall rust <u>Ecdycronartium</u> <u>hecknessii</u>	Lodgepole pine	Colorado	A survey of a naturally regenerated stand on the Estes-Poudre Ranger District, Arapaho and Roosevelt National Forests indicated damaging main stem galls on 39 crop trees per acre and branch galls on an additional 19 trees per acre.
ROOT DISEASES Annosus root disease <u>Heterobasidium annosum</u>	Jack pine	Nebraska	Confirmed at a new location on the Nebraska National Forest. With the recent emphasis on timber management and subsequent intensive inventory surveys, it is expected other centers will be discovered.

Rocky Mountain Region--Summary of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Disease	Host	Location	Remarks
Armillaria root disease <i>Armillaria</i> spp.	Lodgepole pine, ponderosa pine	Colorado, South Dakota,	A survey of a naturally regenerated lodgepole pine stand on the Estes-Poudre Ranger District, Arapaho and Roosevelt National Forest revealed little loss to the disease over a 26 year study. Initially annual losses were estimated at two percent, but have steadily declined since 1960 to less than 0.4 percent. All recent mortality has been in suppressed non-crop trees. The stand currently is fully stocked. Examination of a random selection of 63 ponderosa pine stands on the Black Hills National Forest revealed an 89 percent incidence of root disease. A significant association ($p=.10$) between mountain pine beetle and <i>A.</i> spp. was found in the northern, but not in the southern Black Hills.
Black stain root disease <i>Ceratocystis wageneri</i>	Pinyon	Western Colorado	Aerial and ground surveys since 1975 have shown disease centers in pinyon widespread in Mesa Verde National Park and west of the Continental Divide. Results from seven plots established in 1978 indicate the disease is still active in the Park. In these plots 33 percent of the trees were killed since 1978, averaging 3 trees per plot annually. If the current rate of mortality continues, 55 percent of the stocking will be lost by 1988.
FOLIAGE DISEASES Anthracnose Species unknown	Hardwoods	South Dakota	Wet, warm weather in the southeastern part of the State resulted in an increase in this disease. Fifteen acres of shelterbelts and almost 1000 trees were reported as severely infected.

Rocky Mountain Region--Summary of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Disease	Host	Location	Remarks
Ash leaf rust <i>Uromyces sparganiioides</i>	Green ash	South Dakota	Heavier than normal infections in scattered shelterbelts. At least 14.5 acres heavily infected.
Conifer-aspen rust <i>Melampsora medusae</i>	Aspen	Colorado	Reported as common around Boulder.
Diplodia tip blight <i>Sphaeropsis sapinea</i>	Austrian pine, ponderosa pine	Nebraska, South Dakota	Branch dieback and tree mortality common in windbreaks and urban plantings in Nebraska; also found in an eastern South Dakota windbreak.
Ink spot <i>Gibberinia whetzeli</i>	Aspen	Colorado	Noted on the Rio Grande and San Juan National Forests. Locally heavy infestations. Reports down from 1984.
Juniper blight <i>Phomopsis juniperovora</i> <i>Cercospora sequoiae</i> <i>Kabatina juniperi</i>	Eastern redcedar, Rocky Mountain juniper	Nebraska, South Dakota	Scattered areas in Nebraska reported. More frequent reports in South Dakota than last year.
Lodgepole pine needlecast Species unknown	Lodgepole pine	Colorado, Wyoming	Noted on the Fraser Experimental Forest near Fraser, CO. Common on the Hayden Ranger District, Medicine Bow National Forest and west of Dubois, WY.
Lophodermium needlecast <i>Lophodermium</i> sp.	Lodgepole pine, ponderosa pine	South Dakota, Wyoming	Increased number of reports in the Black Hills on ponderosa pine over 1984. Mostly in canyons adjacent to the Bighorn National Forest on state and private lands on lodgepole pine.
VASCULAR WILTS Dutch elm disease <i>Ceratocystis ulmi</i>	Elm species, including American elm	Colorado, Nebraska, South Dakota	Remains top priority for protection efforts in Colorado's urban forests. 726 positive samples were received by the Colorado State Forest Service from communities. Continues to be a problem throughout Nebraska. Four more counties in South Dakota were confirmed, leaving only Harding County unconfirmed for the disease, which continues to kill 6 to 10 percent of the remaining American elm in communities without management programs.

Rocky Mountain Region--Summary of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Disease	Host	Location	Remarks
NURSERY DISEASES			
Frost injury	Blue spruce	South Dakota	Pockets of damage in nursery beds at the Big Sioux Conifer Nursery occurred due to late spring frost.
Fusarium root and cortical rot <u>Fusarium</u> spp.	Ponderosa pine	South Dakota	High populations of <u>Fusarium</u> spp. in nursery beds at the Big Sioux Conifer Nursery were implicated in the loss of potted nursery stock and shelterbelt plantings.
Storage molds <u>Cylindrocarpus</u> sp.	Black walnut	Nebraska	Fluctuating temperatures in the state-owned storage facility on the Bessey Nursery encouraged mold growth which resulted in destruction of portions of tap roots of large numbers of black walnut. Due to the size of the tap roots, most of the outplanted seedlings survived.
Tip dieback and leafspot complex of <u>Fusarium</u> , <u>Alternaria</u> , <u>Ascochyta</u> and bacterial species	Russian olive	South Dakota	About 100,000, 2-0 seedlings were culled at the Big Sioux Conifer Nursery. Application of Benomyl appeared to arrest spread of the disease.
ABIOTIC Drought	Many species	South Dakota	Drought and hot, dry winds affected trees Statewide. Symptoms ranged from leaf scorch to mortality of newly planted conifers.
Hackberry decline	Hackberry	Nebraska	Continues to be a problem in urban areas, possibly caused by herbicide injury.
Hail	Several species	South Dakota	An estimated 10 acres in Walworth County and 600 acres in Pennington County were diagnosed with hail damage.
Herbicide damage	All species	South Dakota	Continues as a major problem in the eastern half of the State.

Rocky Mountain Region--Summary of diseases in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Disease	Host	Location	Remarks
Seedling mortality	Eastern redcedar, Rocky Mountain juniper	South Dakota	Widespread mortality of planting stock from the Big Sioux Conifer Nursery and the Bessey Nursery outplanted in western South Dakota following dry, spring weather and low soil moisture.
Winter burn or winter kill	Conifers	South Dakota	Several acres of shelterbelts in numerous locations in the southcentral portion of the State showed damage.
OTHER Conifer needle mottling and stippling	Douglas-fir, ponderosa pine, Rocky Mountain juniper, white fir	Colorado	An unknown cause of mottling and stippling of conifer foliage was discovered north of Durango. Symptoms were observed on all year's foliage and developed on 1985 foliage by Fall. Lab analysis of the foliage revealed only minor bleaching of surface tissues. No tree decline or mortality has occurred. Continued observations are planned.
Dead roots	Hackberry	South Dakota	Nematodes found on the roots may be partially responsible for mortality in 2-4 year old shelterbelt plantings in the eastern part of the State.
Ponderosa pine decline	Ponderosa pine	South Dakota	Unexplained decline and mortality of 20 to 80 year old pines in shelterbelts in the southeastern corner of the State. Diplodia tip blight, fluctuating water tables and an infestation of pitch nodule makers found may be involved. Continued monitoring is planned.

STATUS OF INSECTS

WESTERN SPRUCE BUDWORM: Choristoneura occidentalis Freeman

Defoliation was moderate to severe throughout most of the Region, and the acreage estimates this year are the lowest since 1981 (fig. 1). Aerial and ground survey results show approximately 1.6 million acres of forest were visibly defoliated by the budworm throughout the Region (table 2). The most prominent continuous defoliation occurred over 1 million acres in southern Colorado. In Wyoming, visible foliar feeding occurred on over 32 thousand acres (a decrease from 1984). Damage occurred primarily on the Shoshone National Forest and adjacent Wind River Indian Reservation.

Budworm egg mass surveys throughout the outbreak area indicate a decline in egg mass densities from 1984 levels. The surveys also indicate light to moderate defoliation is expected throughout most of the outbreak area in 1986.

A notable budworm infestation in spruce continues on the south flanks of Berthoud Pass near Empire, Colorado. Although the name "western spruce budworm" implies spruce as the preferred host, extensive outbreaks occur in Douglas-fir and rarely in spruce in this Region.

Twenty-eight thousand acres of private land along the Colorado front range were aerially treated for budworm. Colorado State Forest Service officials say treatments were successful at achieving foliage protection and temporary population reduction.

FIGURE 1. AREA DEFOLIATED BY WESTERN SPRUCE BUDWORM
IN THE ROCKY MOUNTAIN REGION, 1979-1985.

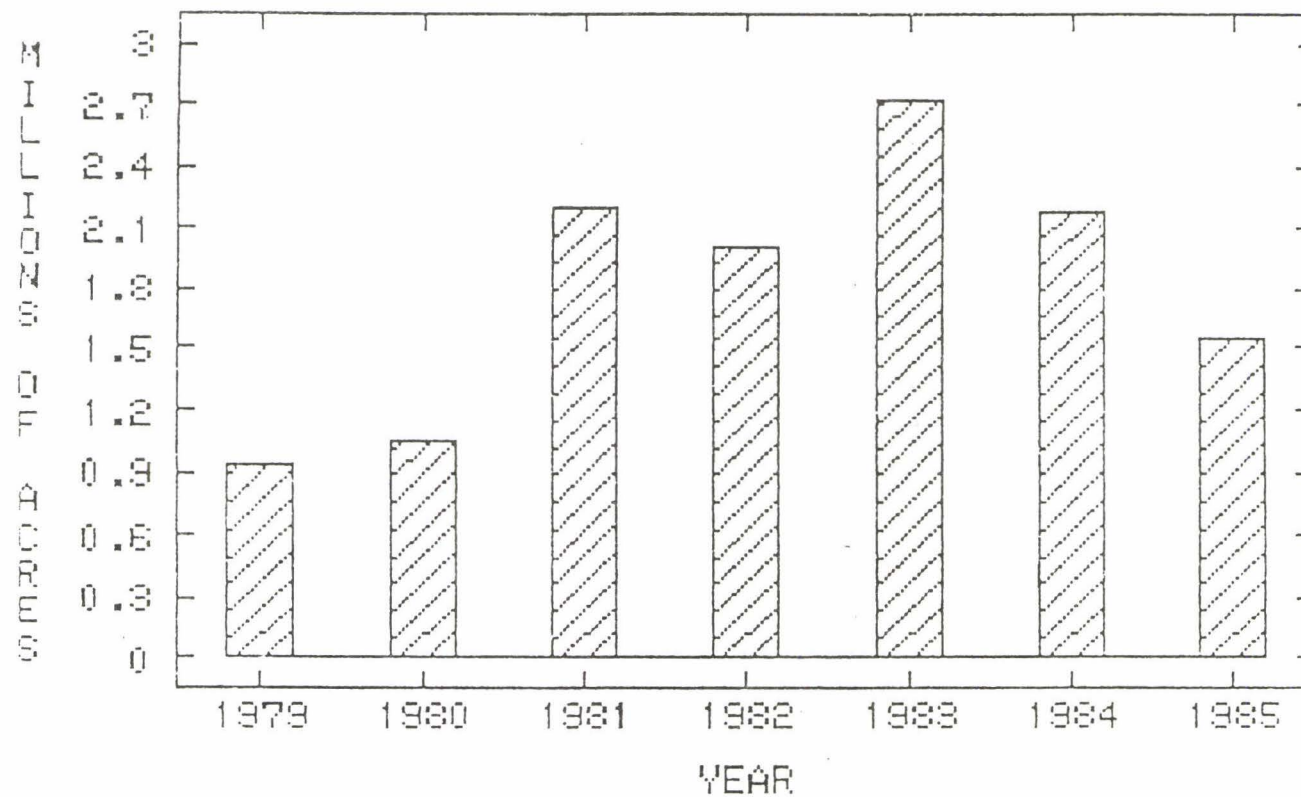


Table 2. 1985 western spruce budworm defoliation acreage by land ownership class ^{1/}

Area	Land Ownership Class				
	National Forest	Other Federal	State	Private	Total
Arapaho	21,360	3,117	1,355	42,339	68,171
Bighorn	1,536	0	0	42	1,578
Grand Mesa, Uncompahgre and Gunnison	49,915	0	362	4,433	54,710
Pike	126,936	1,764	3,793	89,291	221,784
Rio Grande	17,107	0	0	0	17,107
San Isabel	89,737	9,580	0	54,841	154,158
San Juan	663,481	142,190	8,466	237,011	1,051,148
Shoshone	10,733	10,042	0	71	20,846
TOTAL	980,805	166,693	13,976	428,028	1,589,502

^{1/} Acreage infested by budworm was determined from aerial sketch maps and ground surveys. For areas that were ground surveyed in 1985, the 1984 defoliation map was used as a base map. If surveys within the 1984 defoliated area showed that visible defoliation had not occurred in 1985, then that survey area was deleted from the base map. Conversely, if ground surveys outside the 1984 defoliated area showed that visible defoliation had occurred in 1985, then that survey area was added to the base map.

WESTERN TENT CATERPILLAR: Malacosoma californicum Packard

Severe defoliation continued on 31,000 acres of quaking aspen in southwest Colorado - a significant reduction from 94,000 acres in 1984. Most of the defoliation occurred in the San Juan National Forest and adjacent private land (fig. 2). Caterpillars were also noted feeding on gamble oak in these areas. Defoliation estimates and egg mass density counts were lowest since 1978 (figs. 3 and 4). Data and observations this year indicate light to moderate defoliation is expected in 1986.

FIGURE 2. Area of aspen defoliation by the Western tent caterpillar

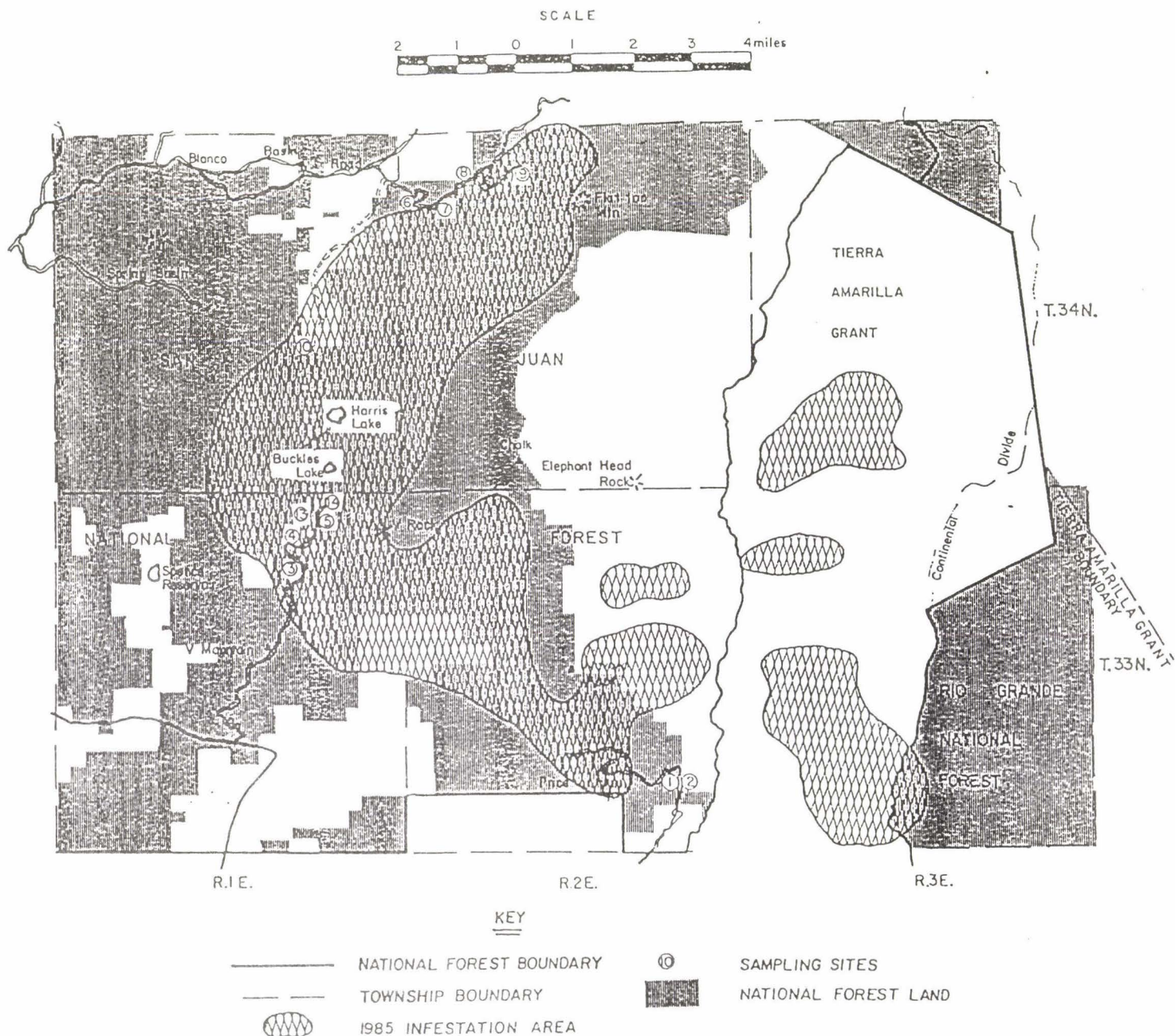


FIGURE 3. ACRES DEFOLIATED BY THE WESTERN TENT CATERPILLAR ON THE SAN JUAN AND RIO GRANDE NATIONAL FORESTS AND ADJACENT LANDS; 1978-1985.

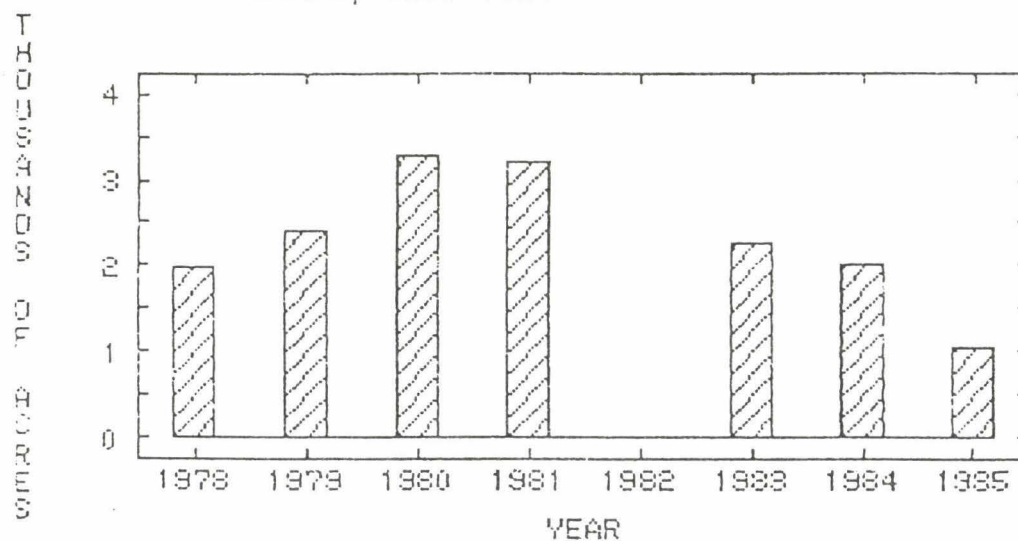
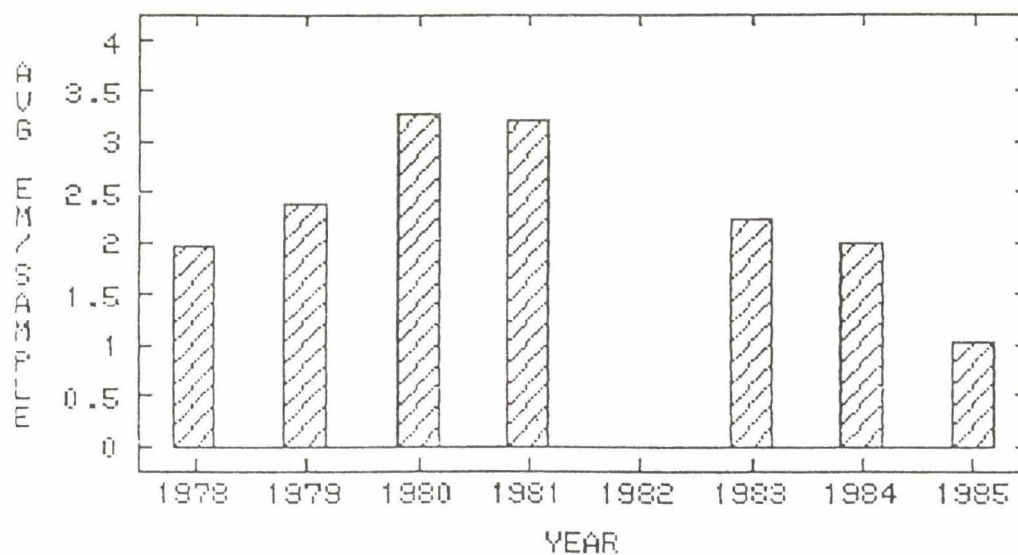


FIGURE 4. WESTERN TENT CATERPILLAR EGG MASS DENSITIES FROM THE TEN ORIGINAL SAMPLING SITES ON THE PAGOSA RANGER DISTRICT, SAN JUAN NATIONAL FOREST; 1978-1985



GYPSY MOTH: Lymantria dispar (Linnaeus)

The gypsy moth trapping program (coordinated by APHIS) continued in 1985. Reports show 2,662 traps were distributed to eleven agencies in Colorado who in turn distributed them throughout the state.

Seventeen moths were caught; fifteen in Colorado and two in South Dakota. One trap in Boulder, Colorado, had ten identified moths and another had two. Five traps in Fort Collins, Colorado, had one moth in each. Two moths were caught in two new locations (1 moth/location) in the Black Hills of South Dakota; one in Custer State Park and one near Keystone. None were caught in the previously "infested" area west of Custer, South Dakota. Trapping will continue at a reduced level in 1986.

MOUNTAIN PINE BEETLE: Dendroctonus ponderosae Hopkins

MPB continues at epidemic levels in the north-central lodgepole pine forests of Colorado. Levels are increasing in South Dakota (Black Hills) on ponderosa pine and continue at similar levels in forested areas of southern Wyoming. Other areas in Colorado where MPB was reported include the Taylor River Ranger District (Western Slope) where reports indicate an increase in beetle attacks on ponderosa pine. Winter kill of MPB occurred in several areas and caused some reduction in rate of the outbreak. Table 3 displays the distribution of MPB within the Region

The High Country Integrated Pest Management Project continued to operate in Summit, Eagle, and Grand counties of Colorado. The multiagency cooperative effort maintains a project organization to coordinate activities. All the lodgepole pine type have been prioritized for treatment based on biological risk, social value, and management objectives. This priority setting scheme allows future management activities to be aimed at the highest collective risk areas. Regeneration of overmature lodgepole stands is being emphasized. Significant MPB reduction occurred this past year. However, due to the large areas of high risk stands, beetle populations have the potential to bounce back rapidly.

Utilizing a mixture of Federal, State and Private dollars, the following accomplishments were attained in 1985, all aimed at reducing MPB populations and reducing the beetle risk within the High Country Integrated Pest Management Project area:

Inventory and Resource Survey	163,403 acres
Environmental Monitoring	61,876 acres
Infested tree survey	57,458 acres
Direct treatment	57,601 trees
Indirect treatment	4,613 acres
Preventive spraying	51,674 trees
Regeneration Harvest	675 acres
Sales preparation	5,606 acres
Site preparation	133 acres
Temporary road construction	29.7 trees

The MPB outbreak in ponderosa pine on the Uncompahgre Plateau in western Colorado was attacked with full force in 1985. Previous to this year control efforts were limited to small sales. Public interest generated from the residents in the Sanborn Park area resulted in an extensive thinning salvage, sanitation, and limited chemical treatment project. Thanks to a viable market for small diameter infested material, both the U.S. Forest Service and Colorado State Forest Service were able to rely heavily on cultural methods to control MPB. Nearly 15 MMBF was removed, 9 MMBF was infested. This resulted in "beetle proofing" nearly 4,000 acres surrounding the Sanborn Park area.

Salvage, sanitation, and thinning of infested ponderosa pine stands continued on the Black Hills and San Juan National Forests where smaller outbreaks are continuing.

MOUNTAIN PINE BEETLE PHEROMONE TRIALS

Early in 1985, Forest Pest Management members from the U.S. Forest Service and the Colorado State Forest Service conducted trials of pheromone baiting for direct control of MPB through sanitation and silvicultural practices in lodgepole pine. Pest Management personnel developed methods and guidelines for applying pheromone use in the field.

Mountain pine lure (MPBLURE) with active ingredients - trans-verbenol, exo-brevicomin and myrcene was the attractant used in the project. Seven hundred and seventeen (717) of these baits were placed on selected trees of susceptible size in 13 areas (14 to 100 baits per area).

Results show all baited areas had more 1985 attacked trees than in 1984, while all surrounding areas had fewer 1985 attacks than in 1984. Based on the Wilcoxon Matched-Pairs Sign-Banks Test, there are significant differences between 1984 and 1985 attacks per acre for both baited and non-baited areas.

Results indicate the pheromone lures can limit the spread of beetle infestations in lodgepole pine and hold the infestation in a more condensed area. The strategy of using pheromones for manipulating MPB populations needs more development.

Economical and biological efficiencies of pheromone use strategies must be better understood before they can be considered practical for operational use. Extensive pilot testing under a wide range of environmental conditions is needed to get a better understanding of how to maximize the efficiencies of baiting trees with pheromones.

CLEARWATER YARDER PILOT PROJECT

In 1983, the Wyoming State Forestry Division submitted a proposal to the U.S. Forest Service in Region Two to construct and operate a Clearwater Yarder to help reduce losses to MPB on steep slopes in Wyoming. The project was delayed and extended to fiscal year 1985 due to late matching funds.

Work began in 1984 on Casper Mountain, Wyoming. Further delays occurred due to low availability of yarder components. Also, manpower was limited because the severe fire season kept personnel on fire duties. Currently, about 20 percent of the work is completed. The remainder of the project is estimated to be completed by October of 1986. A final report for the project will be furnished approximately in February 1987. Use of this technology is expected to result in an increase in our capability to minimize adverse effects of bark beetles on steep slopes.

Table 3. Regional Distribution of Mountain Pine Beetle by Host and Landownership

<u>COLORADO</u>	<u>PONDEROSA</u>		<u>LODGEPOLE</u>		<u>WHITE - LIMBER</u>	
	NO. TREES	ACRES	NO. TREES	ACRES	NO. TREES	ACRES
Landownership						
Pike	226	110	-	-	-	-
Rio Grande	-	-	-	-	-	-
Roosevelt*	-	-	50,187	36,833	-	-
Routt*	-	-	48,557	27,493	-	-
San Juan	3,997	1,174	-	-	-	-
GM/Unc/Gunnison	14,274	10,538	-	-	-	-
White River*	-	-	239,932	73,327	-	-
TOTAL NF	18,497	11,822	338,676	137,653		
Other Fed.	103	51	115,312	42,404	50	98
State	-	-	9,426	4,343	-	-
Private	7,056	2,145	144,657	61,487	-	-
GRAND TOTAL	25,656	14,018	608,071	245,887	50	98
 <u>WYOMING</u>						
Landownership						
Bighorn	-	-	436	165	-	-
Black Hills	42,746	15,537	-	-	-	-
Medicine Bow	-	-	12,141	6,251	-	-
Shoshone	-	-	468,613	55,166	13,306	3,966
TOTAL NF	42,746	15,537	481,190	61,582	-	-
Other Fed.	155	95	10,502	5,820	162	267
State	1,206	536	4,829	1,504	170	68
Private	4,570	2,241	118,912	16,517	12,271	5,824
GRAND TOTAL	48,677	18,409	615,433	85,423	25,909	10,125
 <u>SOUTH DAKOTA</u>						
Black Hills	8,015	5,851	-	-	-	-
Other Fed.	423	248	-	-	-	-
State	105	50	-	-	-	-
Private	791	441	-	-	-	-
TOTAL	9,334	6,590				

*Includes portions of Arapaho NF

IPS ENGRAVER BEETLES: Ips spp.

These omnifarious bark beetles are popping up at varying levels throughout the Region. A notable outbreak in the Black Hills of South Dakota started in the north-facing foothills in 1984 and expanded in 1985. Several areas in the interior of the Hills, first diagnosed as MPB, were confirmed as Ips. Pockets of tree mortality range in size from 3 to 150 trees. Increases in both Ips and MPB have some local foresters speculating a massive outbreak.

Intensive fires in the pine ridge area of Nebraska have created a suitable opportunity for Ips outbreaks. Small pockets of Ips have been sighted on fringes of some burned areas. Significant build-ups of Ips attacks are expected to develop in 1986, particularly in the area of the McIntosh fire in which 3,000 acres were burned.

DOUGLAS-FIR BEETLE: Dendroctonus pseudotsugae Hopkins

Infestations are reported common along the Front Range and increasing in the Taylor River Ranger District (Blue Mesa Reservoir) on the western slope of the Rockies. Beetle mortality occurred primarily in areas sustaining heavy western spruce budworm defoliation during the past 5-10 years. Particularly heavy areas of infestation include Poudre Canyon (Poudre Park to Elephant Rock), Thompson Canyon (Drake to Estes Park, Drake to Glenhaven), Estes Valley, Red Feather Lakes, Magnolia area of Boulder County, South St. Vrain Canyon (north facing slopes), Ute Pass/Pike's Peak area, and the Conifer area.

The Taylor River Ranger District reports 60 to 90 percent mortality on approximately 1,000 acres between Oregon Gulch and Little Soap Park north of Blue Mesa Reservoir.

Little action has been taken against DFB because of inaccessibility, requirements of treatment prior to June 1 (beginning of adult flight at most Colorado altitudes), and lack of markets for Douglas-fir.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming

Insect	Host	Location	Remarks
American aspen beetle <i>Gonioctena americana</i>	Aspen	Colorado	Infestation area covered about 100 acres in Teller County.
Ash borer/lilac borer <i>Podosesia syringae</i>	Green ash, lilac	Nebraska South Dakota	Several shelterbelts were moderately to heavily infested throughout the states. Ornamentals were severely affected near Omaha.
Ash flower gall mites <i>Eriophyes fraxini flora</i>	Green ash	South Dakota	Occurred statewide but the number of infested trees was lower than in 1984.
Ash plant bug <i>Tropidosteptes</i> spp.	Green ash	South Dakota	Several reports of very severe infestations throughout the state.
Ash sawflies <i>Iethida cordigera</i>	Green ash	South Dakota	Several shelterbelts in the southeastern part of the state were moderately to severely infested.
Aspen two-leaf tier <i>Sciaphila duplex</i>	Aspen	Colorado	Found north of Rand.
Bagworm <i>Apterona helix</i>	Siberian elm	Wyoming	Was found on a shipment of Siberian elm from Utah to Rock Springs.
Black walnut caterpillars <i>Datana integerrima</i>	Black walnut	South Dakota	A one-acre shelterbelt in Minnehaha County contained high infestations.
Bostrichid Bostrichidae (family)	Green ash Honeylocust	Colorado	Found scattered, in southeastern Colorado.
Bronze birch borer <i>Agrius anxius</i>	Birch	South Dakota Colorado	Reports of this pest have been increasing for several years and continued to increase during 1985.
Buffalo treehopper <i>Stictoccephala bubalus</i>	Willow Siberian elm	Colorado	Found on 150 saplings near Hygiene.
Cecropia moth <i>Hyalophora cecropia</i>	Prunus spp.	South Dakota	Scattered reports of caterpillars defoliating individual trees.
Cerambycid wood borer complex	Various pines, hardwoods	Colorado South Dakota	A nuisance to households. Several calls received regarding beetle emergence from firewood.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
Cooley spruce gall aphid <i>Adelges cooleyi</i>	Blue spruce, Douglas-fir, Engelmann spruce	Colorado	Continues to be common on ornamentals.
Cottonwood leaf beetle <i>Altica bimarginata</i>	Cottonwood	Wyoming	Undetermined damage occurring.
Cottonwood leafminer <i>Phyllonorycter tremulordielia</i>	Cottonwood	Wyoming	Goshen, Platte and Uinta counties.
Cottony maple scale <i>Pulvinaria innumerabilis</i>	Oak Honey locust	South Dakota	A few heavy infestations on saplings in the central part of the state.
Douglas-fir pole beetle <i>Pseudophyesinus nebulosus</i>	Douglas-fir	Colorado	Scattered occurrence along the Front Range.
Douglas-fir sawfly <i>Neodiprion</i> sp.	Douglas-fir	Colorado	A couple of larvae were found on a tree along the Poudre River.
Douglas-fir tussock moth <i>Orgyia pseudotsugata</i>	Douglas-fir spruce	Colorado	Light to moderate defoliation on ornamental spruce. Heavy defoliation occurred in the Rampart Range/Platte River drainage
<i>Diorystria</i> twig moth <i>Diorystria ponderosa</i>	Ponderosa pine	Nebraska	A problem in central and western part of the state.
<i>Diorystria</i> pine moth <i>Diorystria tumicolell</i>	Ponderosa pine	Nebraska	A problem in central and western part of the state.
Eastern tent caterpillar <i>Malacosoma americana</i>	Hackberry Walnut	South Dakota	Two shelterbelts were infested in Minnehaha County.
Elm leaf beetle <i>Pyrrhalta luteola</i>	American elm Siberian elm	Colorado, Nebraska, South Dakota	Mostly a nuisance.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
Elm leaf miner <u>Brachys aerosus</u>	American elm	South Dakota	Approximately 5 acres were lightly to moderately infested in Minnehaha County.
Eriophyid mites Eriophyidae (family)	Hardwoods Conifers	Colorado	Locally serious statewide.
European pine sawfly <u>Neodiprion sertifer</u>	Scotch pine	South Dakota	One small infestation on ten trees in Minnehaha County.
Fall webworm <u>Hyphantria cunea</u>	Numerous Hardwoods	Colorado Nebraska South Dakota	Was commonly found throughout the region.
Grasshoppers Numerous species	All species	South Dakota Nebraska	Populations became so high in the north-central part of South Dakota that entire shelterbelts were being stripped. Coupled with dry weather, some tree species have been virtually eliminated in scattered belts.
Glover's silk moth <u>Hyalophora gloveri</u>	Skunkbush sumac	Colorado	Occurred on the Pawnee National Grasslands on several shrubs.
Gouty pitch midge <u>Cedidomyia piniinopis</u>	Ponderosa pine	Colorado	Was noted on a few trees near Mancos.
Grey blister beetles <u>Epicauta fabricii</u>	Caragana	South Dakota	Almost 100% defoliation occurred in scattered shelterbelts in Hughes County.
Hackberry lace bugs <u>Corythuca celtidis</u>	Hackberry	South Dakota	Mostly a nuisance in the southeast part of the state.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
Honeylocust podgall midge <i>Dasineura gleditschiae</i>	Honeylocust	South Dakota	Becoming more common throughout the state. One belt of 400 trees had virtually every tree infested.
Honey suckle aphid <i>Hyadaphis tataricae</i>	Honey suckle	South Dakota Wyoming Nebraska Colorado	Continues to expand its range across each of these states. Bushes rarely die with 2-3 years infestation, growth is reduced and in some cases a more "bushier" appearance results.
Introduced pine sawfly <i>Diprion similis</i>	Scotch pine	South Dakota	A light infestation was found in Minnehaha County.
Juniper sawfly <i>Monoctenus</i> spp.	Juniper	Colorado	Discovered on several trees in Fort Collins.
Juniper scale <i>Carulaspis juniper</i>	Rocky Mtn. juniper	Colorado	Was observed in the Carbondale area.
Juniper twig girdler <i>Periploca</i> spp.	Eastern Redcedar	Colorado	Occurred on a few seedlings near Yuma.
Large aspen tortrix <i>Choristoneura conflictana</i>	Aspen	Colorado	Light defoliation reported, primarily in southwest Colorado. Extensive defoliation of aspen along the southern front range near Cucharas Pass. Nearly 21,000 acres of aspen showed visible defoliation.
Lodgepole sawfly <i>Neodiprion</i> spp.	Lodgepole pine	Colorado	Observed on a few trees in Rist Canyon.
Lodgepole terminal weevil <i>Pissodes terminalis</i>	Lodgepole pine	Colorado	An insect was discovered near Tabernash. The extent of the population is unknown.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
Metalic pine pitch nodule moth <i>Petrova metallica</i>	Ponderosa pine	South Dakota Colorado	In eastern South Dakota, this year, damaged terminals could be found in virtually every planting over 5 years old.
Mountain mahoghany bark beetle <i>Chaetophloeus</i> <i>heterodoxus</i>	Mountain mahoghany	Colorado	Observed on a few scrubs near Littleton.
Nevada buck moth <i>Hemileuca nevadensis</i>	Cottonwood	Colorado	Observed on several trees on the Pawnee National Grasslands.
Oak leaf miner <i>Cameraria</i> spp.	Burr Oak	South Dakota	200 trees were moderately infested in Minnehaha County.
Oystershell scale <i>Lepidosaphes ulmi</i>	Cottonwood Maple	South Dakota	Numerous scattered trees with light to moderate infestations in the eastern part of the state.
Peachtree borer <i>Synanthedon exitiosa</i>	Prunus spp.	Colorado	Mostly in southeastern part of state.
Pine budworm <i>Choristoneura</i> <i>lambertiana</i>	Ponderosa pine	Colorado	Extensive defoliation in the southwestern part of the state was visible on 215,000 acres of mixed type.
Pine butterfly <i>Neophasia menapia</i>	Ponderosa pine	Colorado	Spotty populations in Ponderosa pine in southwest Colorado.
Pine needleminer <i>Coleotechnites</i> <i>ponderosae</i>	Ponderosa pine	Colorado	Static to decreasing along the Front Range. Most notable defoliation near the Big Thompson Canyon area of Colorado. Infestation was light in Wyoming.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
Pine needle scale <i>Chionaspis pinifoliae</i>	Spruce Pine	South Dakota	Scattered trees with light to heavy infestations throughout western South Dakota.
Pine needle sheathminer <i>Zelleria haimbachi</i>	Ponderosa pine	Colorado	Undetermined damage near Pagosa Springs and north of Durango. Found with other defoliators in southern Colorado.
Pine stem aphids <i>Cinara</i> spp.	Scotch pine Ponderosa pine	South Dakota	Heavy spring infestations causing branch mortality, dieback and reduced growth to numerous shelterbelts in northcentral South Dakota.
Pine tiger moth <i>Halisidota ingens</i> <i>Halisidota argentata</i>	Pinyon/juniper	Colorado	Populations were widespread in the Durango area and about 5000 acres were infested near Colona.
Pine tip moths <i>Rhyacionia</i> spp.	Austrian pine Ponderosa pine	South Dakota Nebraska	Populations in eastern South Dakota increased. Twelve shelterbelts covering 28 acres were moderately to heavily infested.
Pitch nodule moth <i>Petrova metallica</i> (Ponderosa) <i>Petrova arizonensis</i> (Pinyon)	Ponderosa pine Pinyon pine	Nebraska South Dakota Colorado	Widespread in shelterbelts and on ornamentals. Population is increasing in eastern Nebraska and South Dakota.
Redhumped caterpillar <i>Schizura concinna</i>	Silver maple	Colorado	A local infestation in LaJunta.
Silver-spotted skipper <i>Epagyreus clarus</i>	Black locust	Colorado	Was noted in the Boulder/Fort Collins area.
Smart beetle <i>Magdalis lecontei</i>	Austrian pine	Wyoming	Damage to terminals near Wheatland.
Spider mites <i>Oligonychus ununguis</i>	Spruce	South Dakota	East and southcentral part of the state.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
Spring cankerworm <i>Paleacrita vernata</i>	Numerous Hardwoods	Colorado South Dakota	A few shelterbelts and ornamental trees were heavily infested. However, populations in South Dakota seem to be declining. About 100 acres near Sterling, Colorado were infested.
Spruce beetle <i>Dendroctonus rufipennis</i>	Spruce	Colorado	Spruce beetle-caused mortality has been detected north of Dillon affecting 50-100 trees. Outbreak on the Rio Grande is over.
Spruce bud scale <i>Physokermes piceae</i>	Blue spruce	Colorado	One tree near Gunnison was observed with an infestation of bud scale.
Spruce needle miners <i>Ianiva albolineana</i>	Spruce	South Dakota	East and southcentral part of the state.
Spruce tip moth <i>Griselda radicana</i>	Spruce	Colorado	Discovered near Conifer, extent of infestation is unknown.
Spruce webspinning sawfly <i>Cephalcia</i> spp.	Blue spruce	Colorado	One tree near Franktown.
Twig beetle <i>Pityophthorus aguilus</i>	Ponderosa pine	Colorado	7% of tips on Ponderosa pine were infested, covering several hundred acres northeast of Durango.
Twin-spotted sphinx <i>Smerinthus geminatus</i>	Sandbar willow	Colorado	One tree in Fort Collins.
Ugly nest caterpillar <i>Archips cerasivoranus</i>	Prunus spp.	South Dakota	Only a few scattered trees found infested.
Variable oakleaf caterpillar <i>Heterocampa marteo</i>	Green ash	South Dakota	Occurred in Minnehaha County.
Western balsam bark beetle <i>Dryocoetes confusus</i>	Subalpine fir	Wyoming	Scattered mortality common when beetle and vascular wilt disease occur together.

Rocky Mountain Region--Status of insects in Colorado, Kansas, Nebraska, South Dakota, and central and eastern Wyoming--Continued

Insect	Host	Location	Remarks
White pine aphids <i>Cinara strobil</i>	White pine	South Dakota	Occurred in Lincoln County.
Willow scale <i>Quadraspidiotus gigas</i>	Aspen	Wyoming	In Laramie.
Yellowheaded spruce sawfly <i>Pikonema alaskensis</i>	Spruce	South Dakota	Scattered individual and small groups of light to moderate defoliation in south-east portions of the State.
Zimmerman pine moth <i>Diorystria zimmermani</i>	Ponderosa pine Scotch pine	South Dakota	Primarily in the southern part of the state.

FOREST PEST MANAGEMENT WORKSHOPS

The Forest Pest Management staff group conducted workshops on recognition and suppression of major forest diseases and insects in the Region. Training consisted of two-day workshops each, held in Denver, Colorado, (May 8-9) and Durango, Colorado (May 15-16). Sessions were attended by resource managers from the Colorado State Forest Service, the Bureau of Indian Affairs, the Bureau of Land Management, the National Park Service, private urban arborists, County Extension personnel, and the USDA Forest Service. A total of 41 people were trained at these sessions in 1985.

USE OF HERBICIDES IN REGION 2
 (Major herbicide uses only) ^{1/}

Herbicide	Application Method	Acres Treated					
		1980	1981	1982	1983	1984	1985
2,4-D	Ground	1,036	1,155	585	1,011	1,971	1,672
2,4-D	Aerial	9,950	14,297	15,646	8,287	<u>2/</u>	<u>2/</u>
Picloram (Tordon)	Ground	2,747	2,202	3,161	2,151	2,782	2,812
Glyphosate (Roundup)	Ground	162	197	242	98	235	104
Di camba (Banvel)	Ground	269	399	291	153	339	496

^{1/} Major target species are big sagebrush, sand sagebrush, Canada thistle, leafy spurge, Wyethia and various broadleaf weeds for range improvement and roadside management projects.

^{2/} No aerial application of herbicides in FY 84 or 85.

PESTICIDE USE IN REGION 2 - FY 85 ^{1/}

Type of Pesticide	Chemical Used	Target Pest	Units ^{2/} Treated
Fumigant	Methyl bromide	Nematodes and Fusarium root rot in nursery beds	15
Fungicide	Benomyl	Phomopsis blight in eastern red-cedar nursery stock	62
	Bordeaux mixture	Diplodia tip blight in nursery stock	2
	Chlorothalonil	Diplodia tip blight in nursery stock	6
	Dodine	Shothole disease in nursery stock	6
Herbicide	Bromacil	General weeds	5
	Dacthal	Nursery weeds	19
	Dalaphon	General weeds	4
	Dicamba	Noxious weeds	262
	Dicamba	Range vegetation	30
	Dicamba/2,4-D	Noxious weeds	204
	Glyphosate	Nursery weeds	10
	Glyphosate	Noxious weeds	94
	MSMA	Noxious weeds	12
	Monuron	Nursery weeds	3
	Paraquat	Nursery weeds	1
	Picloram	Noxious weeds, range vegetation	2,402
	Picloram/2,4-D	Noxious weeds	366
	Picloram/Dicamba	Noxious weeds	44
	Oust	Nursery weeds	1
	Simazine	Nursery weeds	17

Type of Pesticide	Chemical Used	Target Pest	Units Treated ^{2/}
Herbicide	Tebuthiuron	Range vegetation	250
	Trifluralin	Nursery weeds	10
	2, 4-D	Range vegetation	723
	2, 4-D	Noxious weeds	694
	2, 4-D	Poisonous plants	255
Insecticide	<u>Bacillus thuringensis</u>	Western spruce budworm, pine budworm	190
	<u>Bacillus thuringensis</u>	Mosquitoes	1
	Carbaryl	Cottonwood leaf beetle, grasshoppers in nursery beds	5
	Carbaryl	Mountain pine beetle prevention	6,750 trees
	Coumaphous	Cattle ticks and flies	900 head
	Dimethoate	Pine tip moth in nursery beds	24
	Lindane	Mountain pine beetle control	5,460 trees
	Lindane	Western pine beetle control	22,000
	Malathion	Grasshoppers	3,832
	Pheromones	Mountain pine beetle	717 lures
Rodenticide	Toxaphene	Cattle ticks, flies, lice	363 head
	Aluminum phosphide	Black-tailed prairie dogs	49
	Aluminum phosphide	Ground squirrels	257 burrows
	Strychnine	Pocket gophers	2,780

Type of Pesticide	Chemical Used	Target Pest	Units ^{2/} Treated
Rodenticide	Warfarin	Mice	7 buildings
	Zinc phosphide	Black-tailed prairie dogs	10,718
Repellent	Thiram	Elk	1
Piscide	Rotenone	Undesirable fish	17 stream miles

^{1/}

Includes use by the USDA Forest Service, other federal agencies, permittees, licensees and grantees.

^{2/}

Units are in acres unless otherwise indicated.

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